

A photograph of astronaut Steve Robinson in a white spacesuit working on the Canadarm2 of the International Space Station. The arm is a long, white, articulated structure with various mechanical components. The background shows the Earth's blue and white horizon from space.

You're the Crew Surgeon

https://upload.wikimedia.org/wikipedia/commons/e/e5/STS-114_Steve_Robinson_on_Canadarm2.jpg

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Disclaimer

- The opinions expressed are my own and should not be taken to represent those of the US Department of Defense, USAF, FAA, NASA, or any other agency or organization, nor is any product endorsement intended or implied.
- For the original article on which this presentation is based, please refer to: Huhn TP. You're the Flight Surgeon. Aviation, Space, and Environmental Medicine. 2011; 82(8):833-4.

This scenario, while based on an actual clinical aviation case, does not represent a specific case in the astronaut corps. Any resemblance to a specific astronaut, past or present, is unintended and purely coincidental

Who is this guy, anyway?



- Kirksville College of Osteopathic Medicine (now A.T. Still University)
- Botsford General Hospital: Family Medicine



- USAFSAM: RAM X

- Aerospace Med
- Occ Med



- DoD Aerospace Medicine Liaison to NASA

The Story Begins...

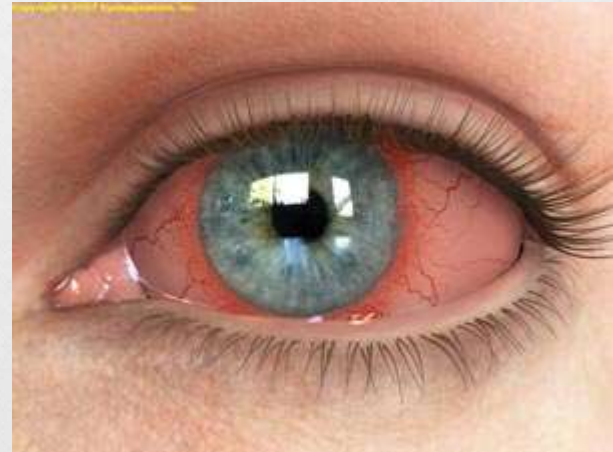
- Late one Friday afternoon, as you are finishing your last chart and looking forward to enjoying the long weekend, you receive a call from the crew offices in building 4S.
- The caller identifies herself as Carla who you know as an astronaut candidate. Her husband prompted her to call the JSC clinic because he is concerned about her left eye.

Quick History

- You have her walk over to the clinic for an urgent care visit:
 - CC: Left eye red and painful with blurred vision and photophobia
 - Onset: This morning with no change during the day.
 - Mitigation: No change with rest and ice
 - Other activities: Helped husband move Holiday decorations to garage attic over lunchtime, lifting items overhead onto dusty shelves.

Physical Exam

- Unremarkable apart from your optometric exam
(The optometrist is seeing another patient right now)
- Exam limited due to pain and photosensitivity
 - Conjunctival inflammation
 - Limbal flush (?)
 - Vision:
 - Baseline 20/20 OS
 - Currently 20/100 OS



<http://pingreemd.com/assets/uploads/2014/08/uveitis.jpg>

Quiz: The Red Eye

Which of the following does NOT belong on the list of potential causes of acutely red eye?

- A. Infectious conjunctivitis
- B. Open angle glaucoma
- C. Foreign body
- D. Corneal abrasion

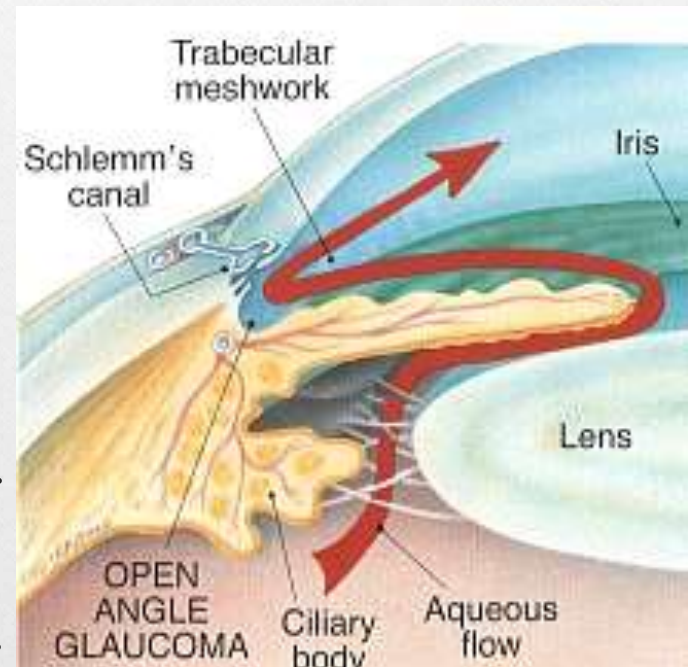
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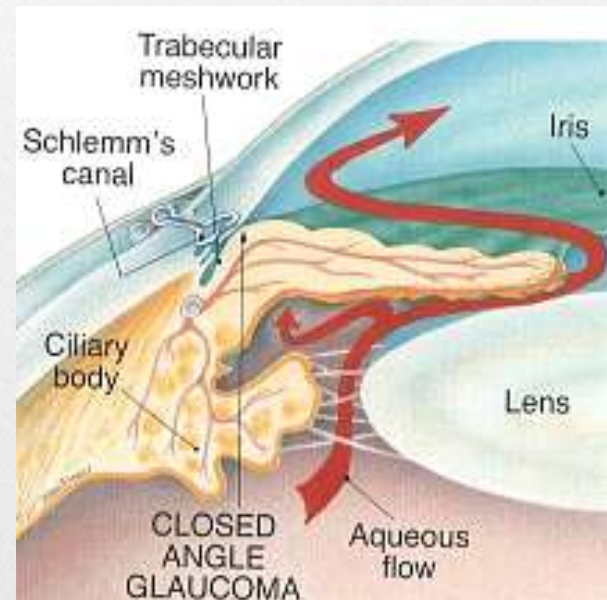
Open Angle Glaucoma

- Dysfunction in the trabecular network
- Aqueous cannot drain effectively
 - IOP rises
 - Optic nerve damage may result.
- Insidious with few symptoms until nerve damage has begun.



Closed Angle Glaucoma

- Iris impedes on the trabecular network, physically blocking aqueous flow.
- Rapid increase in IOP with pain, redness, and vision loss.



<http://www.eyecarespecialists.net/images/closed%20angle%20glaucoma.jpg>

Chart Review

- 37 year old female Caucasian non-smoker not taking any medications.
- Intermittent back pain (not using meds)
- Two years ago, presented to urgent care with swollen right knee and tested for gout and autoimmune disease.
 - Positive for HLA-B27; treated by rheumatologist with a short course of systemic steroids.
 - No signs or symptoms of ankylosing spondylitis
 - Granted a waiver for HLA-B27 status.
 - Asymptomatic since that time.

Quiz: Differential

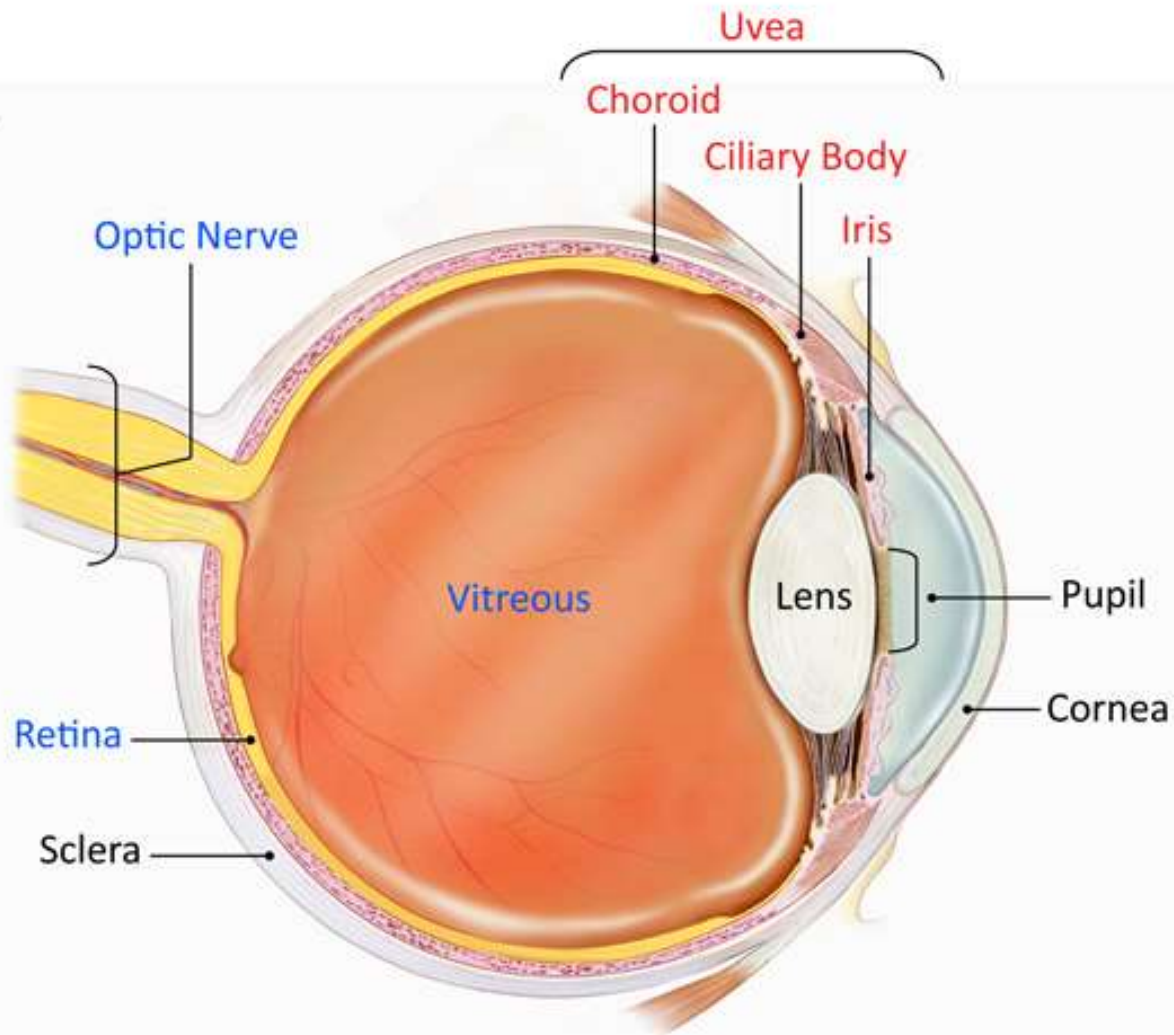
You relate her history and exam, then tell the optometrist that you suspect Carla is suffering from:

- A. A corneal abrasion
- B. Scleritis
- C. Microbial keratitis
- D. Iritis

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<https://nei.nih.gov/health/uveitis/uveitis>

Quiz Explanation: Corneal Abrasions

- Common cause of the red eye, and Carla's history includes possible trauma (moving Holiday decorations).

BUT:

- Symptoms preceded the traumatic event.
- While she might have a corneal abrasion, it would be incidental to her primary diagnosis.

Quiz Explanation: Scleritis

- Given the degree of pain that she is suffering from, as well as the photophobia and blurred vision, scleritis belongs in the differential.

BUT

- Redness with scleritis is gradual, increasing over several days, and it may have a slight bluish-red hue. (4)
- Gradual onset of symptoms doesn't match her history.

Quiz Explanation: Microbial Keratitis

- A vision threatening infection which presents with severe pain, vision loss, and inflammation. (4)

BUT

- Though it can be associated with ocular trauma as well as soft contact lens wear, her symptoms preceded the suspected injury.
- Additionally, she doesn't wear contact lenses, as her uncorrected vision is 20/20.

Uveitis

- Inflammation of the uveal tract
- Anterior uveitis, inflammation of the iris (iritis) or anterior part of the ciliary body (cyclitis), is the most common
 - Affects approximately 8/100,000 people annually,
 - Although 50% of anterior uveitis cases are idiopathic, it may be caused by trauma, intraocular tumors, medications, herpes, or be lens induced
 - Approximately 50% of patients with anterior uveitis test positive for HLA-B27. (6)

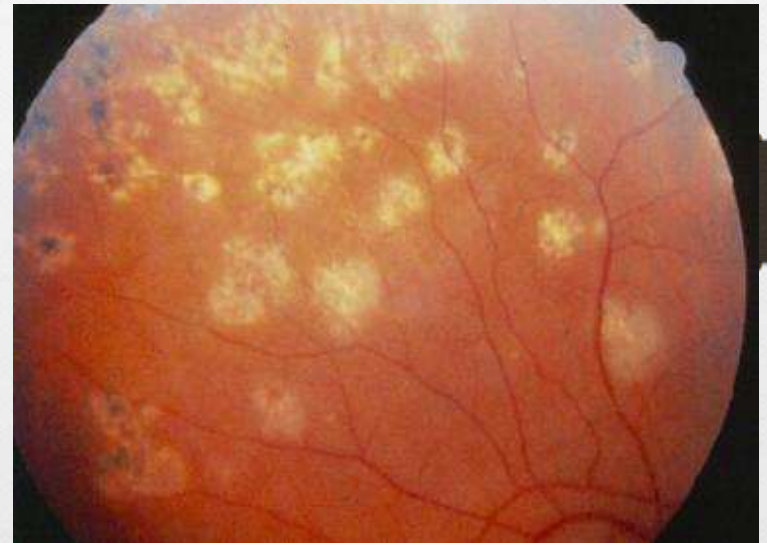
Iritis



Iritis - note increased redness
around the outer ring of the iris

Posterior Uveitis

- Posterior uveitis, in which the retina and/or choroid layers are affected
 - The least common
 - Usually caused by an infectious agent



<http://emedicine.medscape.com/article/1227778-overview#a5>

Uveitis Treatment

- Steroids are the mainstay of treatment for anterior uveitis, and cyclopegics may be used for patient comfort.
- Control underlying immune disease (if present)
 - NSAID's
 - Systemic steroids
 - Immune modulators are often used in an effort to control an underlying immune disease if one is present, but may also be used if topical therapy is insufficient.
- **Treatment of the underlying condition will not resolve the iritis unless the iritis is infectious in nature.**

Carla's Treatment

- Topical steroids for uveitis control
- Systemic for immune disorder control
 - Systemic steroid burst and taper
 - Etanercept (Embrel)
- Response:
 - Uveitis in remission
 - Intermittent back pain resolved.



Quiz: Long Term Prognosis

You review her concerns and tell her that her history of anterior uveitis places her at increased risk for which of the following?

- A. Secondary glaucoma
- B. Central serous chorioretinopathy
- C. Cataracts
- D. Retinal detachment

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Quiz Explanation

- Central serous chorioretinopathy
 - Etiology is not well understood, but there is no definite link to uveitis.
- Cataracts
 - Intraocular inflammation from uveitis generally does not cause cataract unless it is longstanding and untreated, such as what may be found in juvenile rheumatoid arthritis. (2)
 - Cataracts can be found with chronic steroid use due to recurrent iritis
- Retinal detachment
 - Iritis does not cause retinal detachment, although patients can get a serous retinal detachment from posterior uveitis.

Quiz Explanation

- Secondary glaucoma
 - Uveitis may cause a formation of anterior or posterior synechiae
 - Aqueous humor flow blocked, leading to increased IOP
 - Use slit lamp examination to visualize the anterior chamber and look for synechiae
- With only one episode of acute iritis, other complications are very unlikely.

Treatment Response

- Physical examination post treatment was normal
 - No joint pains
 - Pain-free full range of motion in her major joints and back.
- Ophthalmology exam
 - Vision 20/20 with a quiet anterior chamber and normal intraocular pressure.
 - Slit lamp examination showed a clear anterior chamber with no cells or flare in either eye. Her lenses were clear, with pigmentation of the anterior capsule and no current synechiae.
 - Normal foveal reflex with clear vitreous with no cells.

What to Consider re: Waivers

- Potential sequelae of uveitis
 - Decreased vision, glaucoma, cataract, iris deformities
 - Degraded vision
 - Potential for a relapse in flight.
- Maintenance medications
 - Resupply
 - Cold chain



FAA Guidance

- No specific mention of uveitis, but special issuance (waiver) due to:
 - I. Code of Federal Regulations

All Classes: 14 CFR 67.103(e), 67.203(e), and 67.303(d)

(e) No acute or chronic pathological condition of either the eye or adnexa that interferes with the proper function of the eye, that may reasonably be expected to progress to that degree, or that may reasonably be expected to be aggravated by flying.
 - Guide for Aviation Medical Examiners, “Congenital or acquired conditions (whether acute or chronic) of either eye or adnexa, that may interfere with visual functions, may progress to that degree, or may be aggravated by flying (tumors and ptosis obscuring the pupil, acute inflammatory disease of the eyes and lids, cataracts, or keratoconus.)”
- Medication not as much of a concern

US Military Guidance

- Uveitis:
 - Army / Navy: Allow waiver for single episode of acute uveitis once it has resolved, as long as it is not associated with an underlying systemic condition. (7) (9)
 - USAF: Requires waiver for uveitis except in case of healed, traumatic iritis.
- Medications
 - Nearly all long term systemic prescription medications require a waiver, at least by the local waiver authority.
- HLA-B27 status
 - Army / Navy: specific conditions such as ankylosing spondylitis or chronic back pain to be disqualifying.
 - USAF disqualifies general arthropathies

Quiz: Waiver Potential

What action should you take regarding a medical waiver?

- A. None; her HLA-B27 status does not require a new waiver if she remains asymptomatic.
- B. Because she has no side effects from the medication, she only requires a new waiver for the uveitis.
- C. She requires a new waiver for long term use of medication, but no waiver is required for a single episode of acute, resolved uveitis.
- D. She requires a new waiver for both uveitis and use of a long term medication.

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Quiz Explanation:

- Parameters for ISS crew selection and certification are in Medical Evaluation Document Volume A (MEDA)
 - Medical Disposition Category (MDC)1- Qualified for long and short duration spaceflight and training
 - MDC2 – Qualified for short duration spaceflight and training
 - MDC3 – Qualified for space flight training
- Chronic medication and uveitis both require waivers

Likely Outcome?

- Unlikely to be approved for long duration (>30 day) ISS mission
 - Potential for relapse during extended flight
 - Cold chain and supply issues
- Most likely: MDC2 certification
 - Potential for commercial crew (shorter duration)
 - OK to train (T-38, NBL), OK for CAPCOM



Questions?

References

- Acknowledgements: The views and opinions expressed in this article are the author's and may not reflect those of the USAF, FAA, or Department of Defense. Special thanks to Dr Ryan Davis of the USAF Aeromedical Consultation Service for his assistance.
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